

# **Level I Ergonomics Methodology Guide Supplement For Warehouse and Service Areas**

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## TABLE OF CONTENTS

Acronyms and Abbreviations

Acknowledgments

### SECTION 1.0 INTRODUCTION

1.1	Program Objectives .....	1-1
1.2	Development of Criteria .....	1-2
1.3	Development Process .....	1-3
1.4	Reference to Prior Guides .....	1-4

### SECTION 2.0 ORGANIZATION OF THE GUIDE SUPPLEMENT

2.1	Overview of the Methodology .....	2-1
2.2	Description of the Appendices .....	2-2

### APPENDICES

APPENDIX 1	PREPARATION
APPENDIX 2	RISK FACTOR IDENTIFICATION
APPENDIX 3	PRIORITIZATION OF HAZARDS
APPENDIX 4	HAZARD CONTROL SELECTION (CASE STUDIES)
APPENDIX 5	RECOMMENDATIONS
APPENDIX 6	BLANK FORMS
APPENDIX 7	REFERENCES/BIBLIOGRAPHY

### LIST OF FIGURES

#### FIGURE

1	Level 1 Assessment Process .....	2-1
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## ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFOSH	Air Force Occupational Safety and Health
BEF	Bioenvironmental Engineering Flight
EPRA	Ergonomics Problem Area
ESOH	Institute for Environment, Safety and Occupational Health
fc	Foot-Candle
IERA	Institute for Environment, Safety and Occupational Health (ESOH) Risk Analysis
JR/PD	Job Requirements/Physical Demands (Survey)
M/I	Maintenance and Inspection Work Areas
OSHA	Occupational Safety and Health Administration
PES	Pacific Environmental services, Inc.
PHF	Public Health Flight
PM	Preventative Maintenance
TJI/ADL	The Joyce Institute, a Unit of Arthur D. Little, Inc.
USAF	United States Air Force
WMSD	Work-Related Musculoskeletal Disorders
WPAFB	Wright-Patterson Air Force Base
W/S	Warehouse and Service Areas
lb	Pounds

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## **ACKNOWLEDGMENTS**

This Level I Methodology Guide Supplement for Warehouse and Service Areas was developed as the result of a contract effort by the Institute for Environment, Safety, and Occupational Health (ESOH) Risk Analysis (IERA) under the contract entitled “Environmental and Occupational Health Assessments,” Contract Number F41624-95-D-9017, Order 000101. It is designed as a supplement to the Level I Ergonomics Guide for Maintenance & Inspection Work Areas and the Guide for Administrative Work Areas. Pacific Environmental Services, Inc. (PES) and The Joyce Institute/A Unit of Arthur D. Little, Inc. (TJI/ADL) were the prime contractor and critical subcontractor, respectively. Risk Surveillance, Ergonomics and Hearing Conservation Branch (IERA/RSHE) and Bioenvironmental Engineering personnel from Air Force Materiel Command Bases all contributed to the development effort. This commitment to provide and share technical information, based on sound research and practical application combined with knowledge of Air Force operations, resulted in this Guide Supplement. The Guide Supplement is directed at improving the health, safety, and overall performance of Air Force personnel by preventing work-related musculoskeletal disorders (WMSD) and is a key step in the process used to identify, recognize, and control ergonomics risk factors in the workplace.

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## **1.0 INTRODUCTION**

### **1.1 PROGRAM OBJECTIVES**

The United States Air Force (USAF) has sponsored the development of standard ergonomics assessment methodology guides and management tools, which will be integrated into the AFOSH Program. The methodologies and tools are used as a means to minimize or eliminate work-related musculoskeletal disorders (WMSDs) associated with routine exposure to ergonomics risk factors at Air Force installations.

This Level I Ergonomics Methodology Guide Supplement for Warehouse and Service Areas supplements the Level I Ergonomics Methodology Guide for Maintenance and Inspection Work Areas (M/I) and the Guide for Administrative Work Areas. It is designed to be read and implemented by Bioenvironmental Engineers and Bioenvironmental Engineering Technicians. The purpose of the Guide Supplement is to enable the Bioenvironmental Engineering Flight (BEF) to identify risk factors, to prioritize problems, to select realistic controls, and to facilitate modifications to work areas so that the United States Air Force (USAF) can maintain readiness by improving employee performance and well being.

This Guide Supplement contains only the Appendices related to hazard identification and control for warehouse and service area jobs. For instruction in the use of the Level I Ergonomics Methodology Guides, the reader needs to refer to the M/I Guide.

This Guide Supplement enables users to identify risk factors and recommend corrective actions on most of the jobs and tasks they will observe with the assurance that, in most cases, a professional ergonomist would have made the same decisions. It will also let them know when they should obtain assistance from IERA/RSHE or other ergonomists in cases when the pattern-matching process may not adequately address the problem and a Level II Ergonomics Assessment is needed.

This Guide Supplement provides the USAF with the Methodology it needs to identify and abate ergonomics hazards in a wide range of warehouse and service area jobs.

## **1.2 DEVELOPMENT OF CRITERIA**

The Level I Ergonomics Methodology Guide Supplement for Warehouse and Service Areas (hereafter referred to as the W/S Guide Supplement) details a process that can be applied to the full variety of Air Force warehouse and service jobs.

The Guide Supplement was designed to enable a Bioenvironmental Engineer or Technician with two to three years of experience to conduct aggressive task-based problem-solving efforts in an Ergonomics Problem Area (EPRA). The Guide is designed such that the process can be completed as follow-up to the Job Requirement/Physical Demands (JR/PD) Survey completed by Public Health Flight (PHF) or in response to an Air Force occupational illness investigation.

The Guide was developed in accordance with criteria established by the United States Air Force (USAF). This criteria was that the Guide must be designed to enable users, primarily through visual observations and employee/supervisor interviews, to:

- identify potentially hazardous tasks within a shop and a job;
- determine if the content of the job and task(s) meet established ergonomics risk factor exposure criteria;
- determine which type(s) of additional (Level II) analyses may be used if further quantification of ergonomics hazards is required; and
- choose from a menu of control options (both short- and long-term) which when implemented, will minimize the risk of musculoskeletal disorders by reducing the hazards identified within the job and tasks.

The Guide Supplement enables the user to complete data collection and analysis for warehouse and service work areas in 1-2 hours depending on the number of tasks evaluated. Hazard Control selection and development of a summary report of recommendations also requires 1-2 hours. (The End-user test results and experience with the previous Guides indicate that the time requirements are significantly less.)

The Guide Supplement also includes case studies for typical warehouse and service tasks. The case studies serve as the basis for the pattern-matching process that will be used to “match” the hazards identified in the tasks with controls that, when implemented, will reduce employee exposures to ergonomic risk factors and prevent WMSDs.

The Guide Supplement identifies metrics that will be used to judge the impact of ergonomics improvements on employee health, safety, and performance (e.g., quality, and productivity).

In addition, the Guide Supplement incorporates information and lessons learned from the JR/PD Survey in order to provide an integrated ergonomics analysis and problem-solving process for the Air Force.

### **1.3 DEVELOPMENT PROCESS**

The Guide Supplement design is the result of a development and testing process that benefited from the support and cooperation of Air Force personnel at several AFMC locations:

- IERA/RSHE, Brooks AFB, Texas
- Wright-Patterson AFB, Ohio (WPAFB)
- Eglin AFB, Florida
- Tinker AFB, Oklahoma
- Hill AFB, Utah

**1.3.1 Initial Efforts.** The development of this Guide Supplement began with a review of the scientific literature that had been published related to warehousing and service areas. The purpose of this review was to supplement the ergonomic analysis tools and problem-solving approaches that had been developed for the previous Guides.

Data for the Guides was collected during the actual site visits to Wright-Patterson AFB, Eglin AFB, Tinker AFB, and Hill AFB. Additional site visits were made to Hill AFB and WPAFB in the development of this Guide Supplement. The purpose of the site visits was to collect data (e.g., videotapes, digital photographs, workstation measurements, employee interview results, etc.) on the job types that would be used for developing Case Study Problem-Solving Matrices. The job types were selected by the Air Force and are consistent with “Types of Work” listed in Section III of the JR/PD Survey, which is used by PHF. Many of the jobs observed in the development of the 20 task-based Case Study Problem-Solving Matrices, listed in Table 1.1, are based on a compilation of the most common elements found in one or more jobs at one or more of the bases.

Based on the results of the recent literature review and the site visits, the following components of the Guide Supplement were enhanced or revised:

1. A Level I Ergonomics Assessment Checklist;
2. Checklist Glossary;
3. Corrective Action Scoring List;
4. Case Study Problem Solving Matrices (Corrective Actions); and
5. Minor Modifications and Design Criteria for Major Modifications

These components were used to test the usability of the design of the Guide Supplement.

**1.3.2 Usability Testing.** Those who are interested in a detailed description of the usability testing process and results should contact IERA/RSHE for further information.

## **1.4 REFERENCE TO PRIOR GUIDES**

For further information, and answers to frequently asked questions, please refer to the M/I Guide Introduction. Specifically, for a general overview of Ergonomics, see Section 2.0; for more detailed information on how to use this Guide Supplement, see Section 3.0 of the Guide.

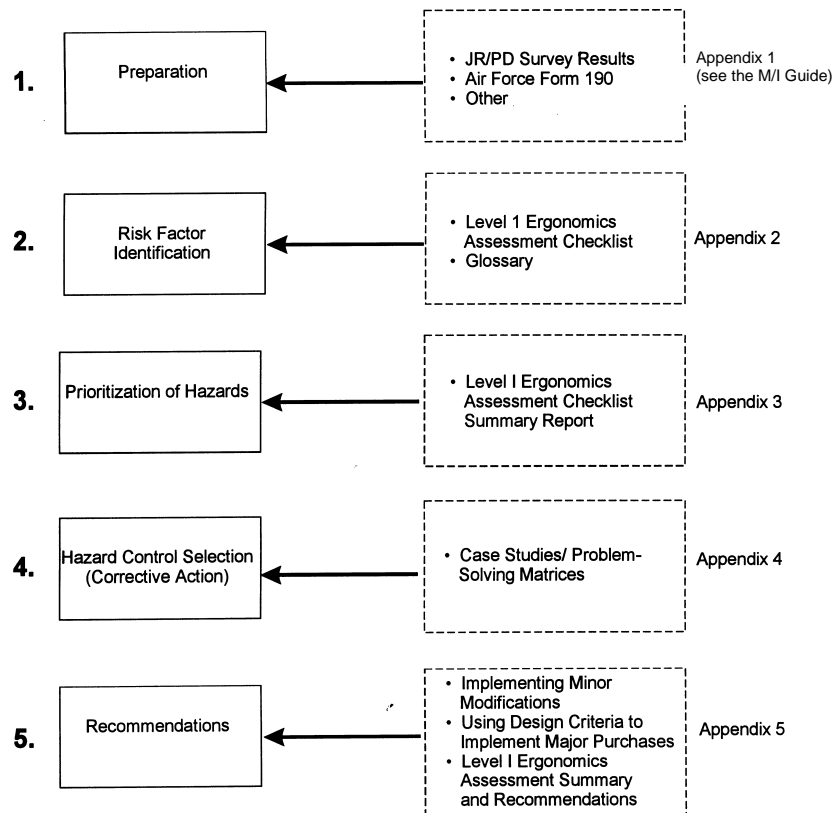
## 2.0 ORGANIZATION OF THE GUIDE SUPPLEMENT

The Guide Supplement is organized so that the parts needed for data collection can be extracted for use in the field. Other parts used in problem prioritization, solution selection, etc., may be left in the BEF shop for later use.

### 2.1 OVERVIEW OF THE METHODOLOGY

The first five appendices correspond with Level I Ergonomics Assessment and Problem-Solving Methodology as shown in Figure 1.

**Figure 1**  
**Level 1 Assessment Process**



## **2.2 DESCRIPTION OF THE APPENDICES**

The appendices provide the tools for implementing this Guide Supplement.

### **2.2.1 Appendix 1: Preparation**

This appendix provides users with a sample summary from the Job Requirements and Physical Demands (JR/PD) Survey, with an Air Force Form 190, and other information that they need to begin the process.

### **2.2.2 Appendix 2: Risk Factor Identification**

This appendix provides users with a sample *Level 1 Ergonomics Assessment Checklist* to use as a guide in completing the checklist they are using on a job. Most importantly, it includes the Glossary, which defines each checklist question in detail and provides guidelines on what to look for when observing the jobs.

### **2.2.3 Appendix 3: Prioritization of Hazards**

This appendix provides users with a sample of a completed *Checklist Scoring Summary* so that they know how to score the jobs on which they have completed a checklist.

### **2.2.4 Appendix 4: Hazard Control Selection**

This appendix is the focal point for identifying the causes of ergonomics risk factors and for selecting corrective actions. *Case Studies* for 20 tasks in warehouse and service areas are included, along with one case study, Lifting, from the M/I Guide. This case study has been expanded to provide information on warehouse tasks. Case Study problem-solving matrices are organized so that users simply look for the body region and risk factor identified in the Level I Checklist in order to pattern-match the cause with corrective actions, risk factor by risk factor. Once users become familiar with the process, this is probably the only appendix that they will need for subsequent assessments. This appendix also includes an example of a completed *Corrective Action List*.

### **2.2.5 Appendix 5: Recommendations**

This appendix provides an example of a completed *Summary/Recommendations* form so that the user has guidance when completing Step 5. A section on “Using Design Criteria to Implement Major Purchases” is included to provide users involved in the selection of equipment and tools, with the ergonomics criteria upon which to evaluate products. The evaluation forms provided can be sent to prospective vendors to help identify which products meet the criteria. It also includes the “Implementing Minor Modifications” section, which provides further detail on selected Corrective Actions referred to in the Case Studies.

### **2.2.6           Appendix 6: Blank Forms**

This section simply provides the blank forms that users can copy in order to apply the Methodology. The forms included are:

- Cover Page
- Checklist: Part I, Part II, Part III & IV
- Ergonomics Scoring Summary
- Corrective Action List
- Summary and Recommendations

### **2.2.7           Appendix 7: References/Bibliography**

References noted in the Guide and the bibliography for this effort are found in this section.

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